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Weight and Volume Prediction Equations for Sand Pine Trees in Florida

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30 feet in height as a consequence of the emphasis on selecting plots in younger stands. The 10 trees greater than 4 inches in DBH and 30 feet in height included trees up to 21 years old. Stands with less than 1,210 trees per acre contributed 35 trees; stands with more than 1,210 trees per acre provided 25 trees. Within each of these density classifications, sample trees were similarly distributed across DBH and height classes.

The CSP sample trees were obtained from plantations with typical commercial pulpwood densities and were up to 20 years old (Table 2). CSP trees were somewhat larger than the OSP trees (Table 3) and were well distributed across DBH and height classes.

Predictive Equations

In general, the combined variable model (Tables 4 and 5) was superior for stem and whole tree components, and the allometric model (Table 6) was better for branch, foliage, and crown characteristics. These non-stem components were inversely related to tree height, indicating that crown components did not increase in quantity with increasing tree height, a fact observed in other studies (Rockwood et al. 1980, Frampton 1981).

Equations estimating stem and whole tree contents of OSP and CSP had high coefficients of determination (Tables 4 and 5). Coefficients of 0.97 were typical for stem equations. Whole tree equations were less reliable, with coefficients as low as 0.91. Crown components were predicted with lowest precision, with OSP branch, foliage, and crown estimation usually better than for CSP (Tables 4, 5, and 6).

The combined variable equations presented in Tables 4 and 5 have the desirable property of additivity, i.e., summed regression coefficients of components equal the coefficients of the derived total. For example, the OSP stem dry weight coefficients for wood and bark sum to those for the stem (within rounding limits):

	b_0	b_1
Wood	1.2099	.031162
Bark	.7232	.004396
Wood + Bark	1.9330	.035556

and similarly on a whole tree basis:

	b_0	b_1
Stem Wood + Bark	1.9330	.035556
Branch	2.2633	.013860
Foliage	2.1671	.003733
Tree	6.3634	.053146

Estimates obtained from these equations consequently are additive, making estimates of tree components add to the various estimated totals.

Table 4. Combined variable *Ocala* sand pine tree weight and volume prediction equations for 20 components.

		Equation Parameters[a]		
Component	**Y**	**b_0**	**b_1**	**R^2**
Stem Wood				
Vol. I.B.	ft.^{3}	0.0333	.001182	.990
Green Wt.	lb.	2.8995	.067179	.987
Dry Wt.	lb.	1.2099	.031162	.976
Stem Bark				
Green Wt.	lb.	1.3849	.007908	.947
Dry Wt.	lb.	0.7232	.004396	.941
Stem				
Vol. O.B.	ft.^{3}	0.0612	.001342	.991
Green Wt.	lb.	4.2842	.075087	.987
Dry Wt.	lb.	1.9330	.035556	.978
Branch Wood				
Green Wt.	lb.	3.8382	.025426	.758
Dry Wt.	lb.	1.5582	.011558	.767
Branch Bark				
Green Wt.	lb.	1.5454	.006863	.739
Dry Wt.	lb.	0.7050	.002298	.581
Branch				
Green Wt.	lb.	5.3837	.032289	.760
Dry Wt.	lb.	2.2633	.013860	.754
Foliage				
Green Wt.	lb.	5.5314	.009746	.494
Dry Wt.	lb.	2.1671	.003733	.481
Crown				
Green Wt.	lb.	10.9149	.042035	.708
Dry Wt.	lb.	4.4304	.017593	.711
Tree				
Green Wt.	lb.	15.1993	.117122	.938
Dry Wt.	lb.	6.3634	.053146	.945

[a] Equation format: $Y = b_0 + b_1 * DBH^2 * TH$ with *DBH* in inches and *TH* in feet.

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English to Metric Conversion Factors

Multiply	By	To Obtain
Inches	2.540	Centimeters
Feet	0.3048	Meters
Cubic Feet	0.02832	Cubic Meters
Pounds	0.4536	Kilograms
Tons	0.9072	Metric Tons

Metric equivalents of the OSP and CSP tree prediction equations in Tables 4, 5, and 6 are presented in Appendices 1, 2, and 3, respectively.

Appendix 1

Metric combined variable Ocala sand pine tree weight and volume prediction equations for 20 components.

Component	Y	Equation Parameters[a] b_0	b_1	R^2
Stem Wood				
Vol. I.B.	dm^3	0.9420	.017023	.990
Green Wt.	kg	1.3152	.015496	.987
Dry Wt.	kg	0.5488	.007188	.976
Stem Bark				
Green Wt.	kg	0.6282	.001824	.947
Dry Wt.	kg	0.3281	.001014	.941
Stem				
Vol. O.B.	dm^3	1.7326	.019328	.991
Green Wt.	kg	1.9433	.017320	.987
Dry Wt.	kg	0.8768	.008202	.978
Branch Wood				
Green Wt.	kg	1.7410	.005865	.758
Dry Wt.	kg	0.7068	.002666	.767
Branch Bark				
Green Wt.	kg	0.7010	.001583	.739
Dry Wt.	kg	0.3198	.000530	.581
Branch				
Green Wt.	kg	2.4420	.007448	.760
Dry Wt.	kg	1.0266	.003197	.754
Foliage				
Green Wt.	kg	2.5090	.002248	.494
Dry Wt.	kg	0.9830	.000861	.481
Crown				
Green Wt.	kg	4.9509	.009696	.708
Dry Wt.	kg	2.0096	.004058	.711
Tree				
Green Wt.	kg	6.8943	.027016	.938
Dry Wt.	kg	2.8864	.012259	.945

[a]Equation format: $Y = b_0 + b_1 * DBH^2 * TH$ with DBH in cm and TH in m.

Appendix 2

Metric combined variable Choctawhatchee sand pine tree weight and volume prediction equations for 20 components.

		Equation Parameters[a]		
Component	**Y**	**b_0**	**b_1**	**R^2**
Stem Wood				
Vol. I.B.	dm^3	3.0530	.014175	.966
Green Wt.	kg	2.3152	.014719	.983
Dry Wt.	kg	0.9389	.007179	.984
Stem Bark				
Green Wt.	kg	1.3849	.001819	.924
Dry Wt.	kg	0.7006	.000914	.906
Stem				
Vol. O.B.	dm^3	4.7142	.016547	.975
Green Wt.	kg	3.7001	.016538	.985
Dry Wt.	kg	1.6395	.008093	.988
Branch Wood				
Green Wt.	kg	4.6349	.005477	.685
Dry Wt.	kg	1.9402	.002471	.670
Branch Bark				
Green Wt.	kg	1.2239	.001035	.656
Dry Wt.	kg	0.3879	.000514	.686
Branch				
Green Wt.	kg	5.8588	.006512	.684
Dry Wt.	kg	2.3281	.002985	.686
Foliage				
Green Wt.	kg	4.3808	.003621	.564
Dry Wt.	kg	1.6415	.001437	.577
rown				
Green Wt.	kg	10.2396	.010133	.645
Dry Wt.	kg	3.9696	.004421	.665
Tree				
Green Wt.	kg	13.9400	.026671	.908
Dry Wt.	kg	5.6091	.012514	.938

[a] Equation format: $Y = b_0 + b_1 * DBH^2 * TH$ with DBH in cm and TH in m.

Appendix 3

Metric allometric Ocala (OSP) and Choctawhatchee (CSP) sand pine tree weight prediction equations for 10 crown components.

Component	Y	Equation Parameters[a] b_1	b_2	b_3	R^2
OSP					
Branch Wood					
Green Wt.	kg	0.27091	3.6022	-2.0791	.872
Dry Wt.	kg	0.11014	3.3528	-1.7905	.865
Branch Bark					
Green Wt.	kg	0.10402	2.8563	-1.4069	.872
Dry Wt.	kg	0.07394	2.4272	-1.2576	.775
Branch					
Green Wt.	kg	0.38043	3.3579	-1.8661	.880
Dry Wt.	kg	0.17127	3.0444	-1.5750	.868
Foliage					
Green Wt.	kg	1.11592	3.3014	-2.5721	.820
Dry Wt.	kg	0.50636	3.3292	-2.6709	.798
Crown					
Green Wt.	kg	1.26305	3.3270	-2.1840	.870
Dry Wt.	kg	0.54794	3.1448	-2.0211	.855
CSP					
Branch Wood					
Green Wt.	kg	0.45934	3.2899	-2.0428	.718
Dry Wt.	kg	0.18938	3.3270	-2.0593	.723
Branch Bark					
Green Wt.	kg	0.22194	2.7407	-1.7957	.671
Dry Wt.	kg	0.08472	2.6751	-1.6877	.688
Branch					
Green Wt.	kg	0.66355	3.1762	-1.9940	.711
Dry Wt.	kg	0.26749	3.1982	-1.9887	.722
Foliage					
Green Wt.	kg	0.45832	3.1225	-1.9802	.698
Dry Wt.	kg	0.16847	3.0645	-1.8928	.697
Crown					
Green Wt.	kg	1.11361	3.1593	-1.9900	.708
Dry Wt.	kg	0.43084	3.1576	-1.9574	.717

[a] Equation format: $Y = b_1 * DBH^{b_2} * TH^{b_3}$ with DBH in cm and TH in m.